

REMARKS

Applicants respectfully request the Examiner to reconsider the present application in view of the following remarks.

Status of the Claims

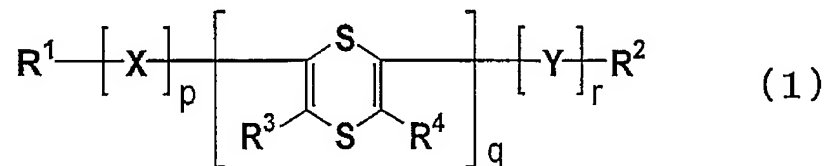
Claims 1, 3-15 are currently pending in the present application. Claims 7-11 are withdrawn from consideration as being directed to a non-elected invention.

Issue Under 35 U.S.C. § 103(a), Obviousness

Claims 1, 3-6 and 12-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakayama *et al.*, "Preparation of α -Quinque- and α -Septithiophenes and their Positional Isomers," *Heterocycles*, Vol. 26, No. 4, pp. 939-942 (1987) (hereinafter "Nakayama") in view of Ganzorig *et al.*, *Jp. J. Appl. Phys.* (1999), Vol. 38, pp. L1348-L1350 (hereinafter "Ganzorig"). Applicants respectfully traverse the rejection.

In the August 20, 2009 Amendment, Applicants amended claim 1 to recite that the composition further comprises the electron accepting dopant substance or the hole accepting dopant substance. As such, inventive claim 1 is drawn to a charge transport organic material having at least the following two Embodiments (A) and (B):

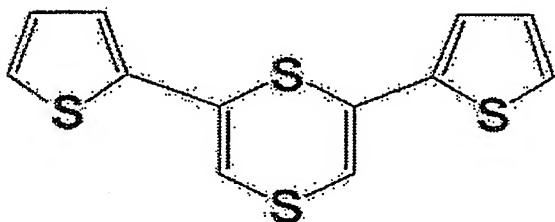
Embodiment (A) wherein the charge transport organic material comprises a combination of an electron accepting dopant substance, and a compound of the general formula (1) having a 1,4-dithiin ring



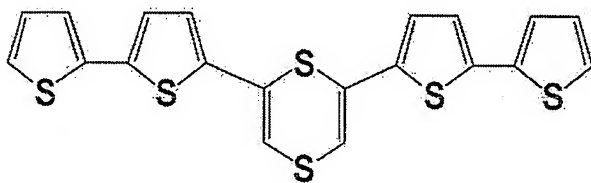
; and

Embodiment (B) wherein the charge transport organic material comprises a combination of a hole accepting dopant substance, and the compound of formula (1).

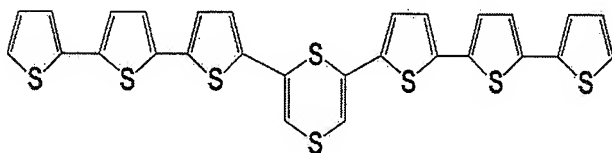
The Examiner has taken the position that Nakayama discloses Compounds 4, 8 and 12 having a 1,4-dithiin ring which fall within the inventive formula (1). Compounds 4, 8 and 12 have the following structure:



Compound 4



Compound 8



Compound 12

The Examiner is aware that Nakayama teaches that these compounds are used as intermediates in the preparation of polythiophenes. Also, the Examiner is aware that Nakayama fails to teach an electron accepting dopant substance or a hole accepting dopant substance to be used with the intermediate compounds 4, 8 or 12 of Nakayama. The Examiner rationalizes that the combination of Nakayama and Ganzorig renders the present invention obvious as follows:

The difference between the instant invention and that of the prior art of Nakayama et al., is that applicant claims using the compounds as charge transporting material and adding and adds electron accepting substance and/or a hole accepting dopant while Nakayama et al., teach the compounds can be polymerize for electroconductors...

However, using them in charge transporting material is inherent in their property as being polymerizable for electroconducting polymers, and adding electron accepting substance and/or a hole accepting dopant to electroconducting compounds is well known in the art. See Ganzorig et al., Jp. J. Appl. Phys. (1999), Vol. 38, pp. L1348-L1350.

Therefore, the instant invention is prima facie obvious from the teachings of the prior arts. One of ordinary skill in the art would have known to use the compounds as charge transporter at the time the invention was made. The motivation is from the teaching of Nakayama et al., that they have electroconductive property. See pages 2-3 of the outstanding Office Action.

As the Examiner acknowledges, Nakayama fails to teach or suggest that the intermediate compounds of Nakayama serve as an electron conductor. The Examiner believes that one skilled in the art would stop the reaction of forming the polythiophenes of Nakayama to first isolate the intermediate compounds 4, 8 or 12 of Nakayama. Then, the artisan would use the intermediate compounds 4, 8 or 12 of Nakayama in a charge transporting material because this is inherent. Then, the artisan would include an electron accepting dopant substance and/or a hole accepting dopant substance because Ganzorig teaches that adding electron accepting dopant substances and/or a hole accepting dopant substances is well known in the art.

Applicants respectfully submit that this rationale used by the Examiner is improper.

The Examiner's attention is directed to *In re Lalu*, 223 USPQ 1257 (Fed. Cir. 1984). In *Lalu*, the Federal Circuit overturned the Board of Appeals decision to uphold the Examiner's

rejection. The Examiner rejected the claims which were drawn to certain sulfonyl chlorides over a reference to Oesterling which taught sulfonyl compounds which were intermediates in the synthesis of sulfonyl chloride final products taught to be useful as base neutralization, catalysis, metal cleaning, and fuel. The intermediate compounds of Oesterling were structurally similar to the claimed sulfonyl chlorides. The Examiner's rejection was based on the premise that: 1) the intermediates would have the same properties as the final product even though the reference was silent as to the properties of the intermediate (other than their usefulness as intermediates); and 2) the artisan would be motivated to stop the synthesis to modify the structure of the intermediates to have the structure of the claimed compounds which were structurally similar homologs.

The Federal Circuit disagreed based on the following reasoning:

There is no disclosure that the Oesterling compounds would have any properties in common with those of appellants' compounds, as those properties of the former relate to the use of the compounds for base neutralization, catalysis, metal cleaning, and fuel. The mere fact that Oesterling's sulfonyl chlorides can be used as intermediates in the production of the corresponding sulfonic acids does not provide adequate motivation for one of ordinary skill in the art to stop the Oesterling synthesis and investigate the intermediate sulfonyl chlorides with an expectation of arriving at appellants' claimed sulfonyl halides for use as corrosion inhibiting agents, surface active agents, or leveling agents.

Oesterling does not teach the isolation and investigation of the intermediate sulfonyl chlorides, but rather discloses, as an optional step, the isolation and purification of the intermediate to obtain a purer sulfonic acid end product. The isolation and subsequent use of the intermediate sulfonyl chlorides in the production of the corresponding useful sulfonic acids is not motivation sufficient to support the structural obviousness rejection. The board has therefore failed to properly establish that the claimed compounds would have been *prima facie* obvious in view of Oesterling.

In the instant case, the artisan would not have any reason to stop the synthesis of the polythiophenes of Nakayama to first isolate the intermediate compounds 4, 8 or 12 of Nakayama

and investigate the use of the intermediates in a charge transporting material for the reasons set forth in *Lalu*.

Moreover, the inventive 1,4-dithiin compounds of the present invention have solubility characteristics making them more favorable to work with than the polythiophene final products of Nakayama. As described in the description [0004] of the present specification, in nonsubstituted thiophene oligomers, the molecules having more than four subunits are mostly insoluble in every solvent. In particular, as shown in Comparative Example 1, a thiophene pentamer was insoluble in DMAc. Furthermore, doped thiophene oligomers are generally more insoluble in organic solvents than non-doped thiophene oligomer.

On the other hand, as shown in Inventive Examples 1-5, the inventive compound having a 1,4-dithiin ring, even though it is doped with a dopant, is soluble in organic solvents.

In addition, as shown in Inventive Examples 6-9, the organic EL element having a thin film obtained from the varnish containing the inventive material emits light uniformly from an entire light-emitting face with no defects being observed. Those skilled in the art cannot foresee the solubility of the inventive material and the light-emitting characteristics of the inventive EL element from Nakayama who teaches that the compounds 4, 8 and 12 are used as intermediates in the preparation of polythiophenes.

In view of the fact that Nakayama and Ganzorig fail to fairly suggest including an electron accepting dopant substance or a hole accepting dopant substance with compounds 4, 8 and 12, nor the advantages derived therefrom, a *prima facie* case of obviousness cannot be said to exist. As such, reconsideration and withdrawal of the rejection of record are respectfully requested.

Inventive Claims 5, 6, 14 and 15

Inventive claims 5, 6, 14 and 15 are further patentable over Nakayama, either taken alone or in combination with Ganzorig. Inventive claims 5 and 14 are drawn to a charge transport thin film and inventive claims 6 and 15 are drawn to an organic electroluminescent element comprising the charge transport thin film of claims 5 and 14, respectively. Applicants respectfully submit that there is absolutely no teaching or suggestion to use compounds 4, 8 and 12 (which are intermediates in the synthesis of polythiophenes) of Nakayama in a thin film or in an organic electroluminescent element. In view of the foregoing, Claims 5, 6, 14 and 15 are further patentable over Nakayama, either taken alone or in combination with Ganzorig.


In view of the above amendment, Applicants believe the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Garth M. Dahlen, Ph.D., Esq. Reg. No. 43,575 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Dated: March 15, 2010

Respectfully submitted,

By 

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